

(12) UK Patent Application (19) GB (11) 2 093 625 A

(21) Application No 8105823
 (22) Date of filing 24 Feb 1981
 (43) Application published
 2 Sep 1982

(51) INT CL³
 G11B 3/60

(52) Domestic classification
 G5R FA
 E2A 370 374 377 428 GB

(56) Documents cited
 GB A 2042240
 GB 1393188
 GB 1093366

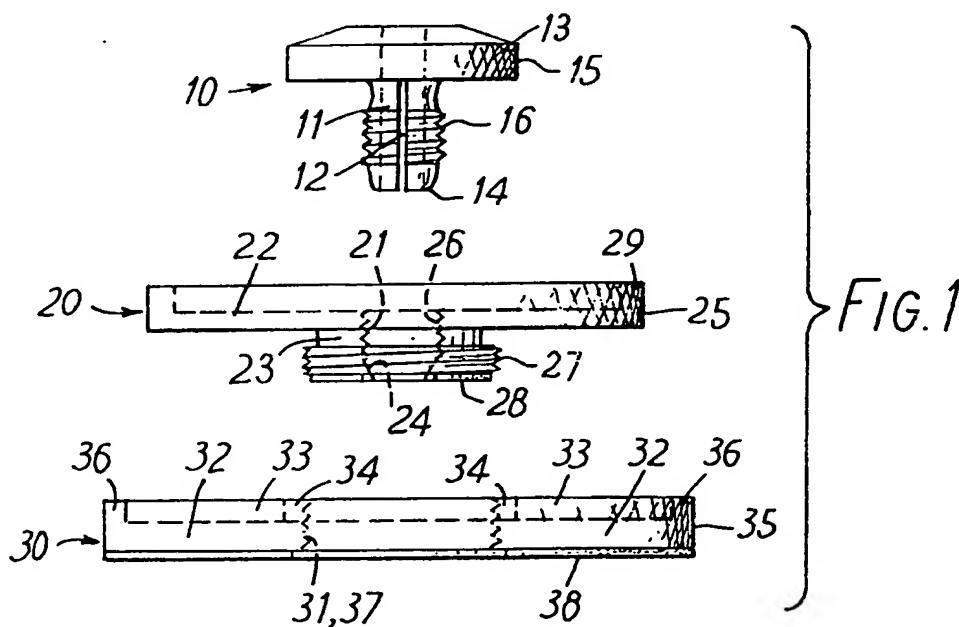
(58) Field of search
 E2A
 F2U
 G5R

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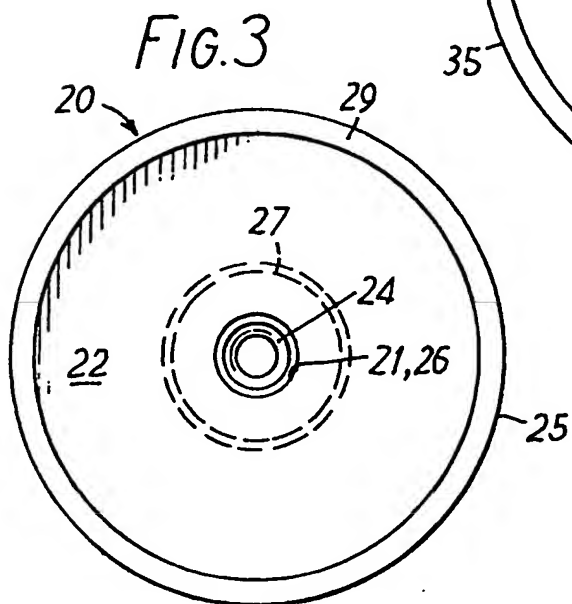
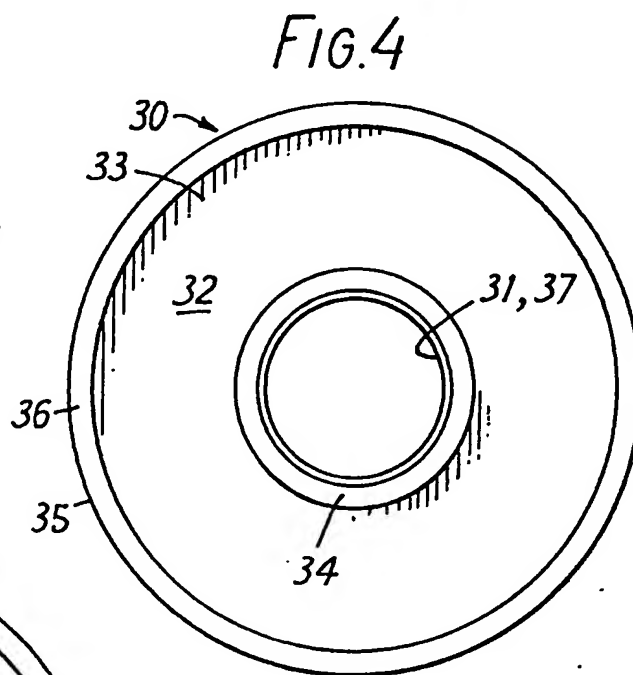
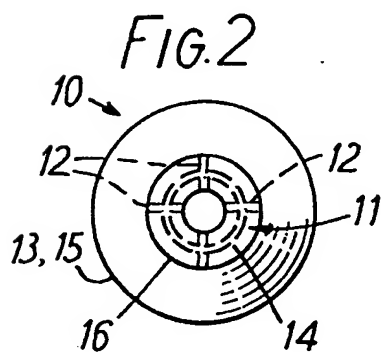
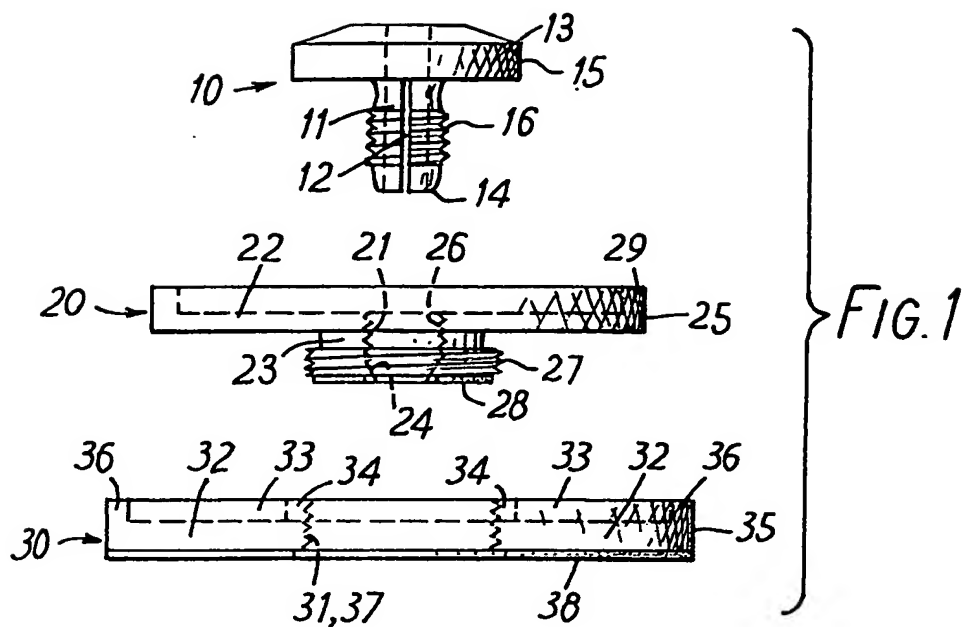
(54) Clamp mechanism

(57) The mechanism is for clamping an article, e.g. a phonographic record disc to a support therefor, e.g. a turntable platter, the support being fast with a spindle which extends through the article. The mechanism comprises a longitudinally split cylindrical collet 10 to fit over the spindle. The collet is cooperable with a second member 20 which acts to compress the collet fingers radially inwards into tight gripping engagement of the spindle. A third member 30 cooperates with the second member so as to be movable longitudinally of the spindle axis relative to the second member and for effecting clamping or release of the article between this third member and the support.



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FIG. 5

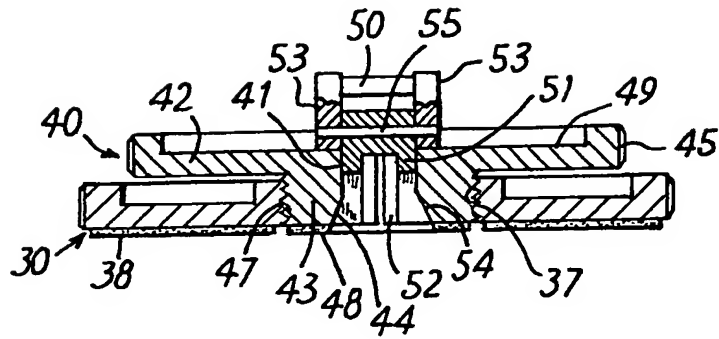


FIG. 6

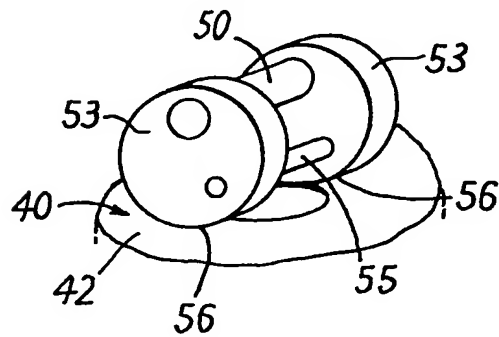


FIG. 7

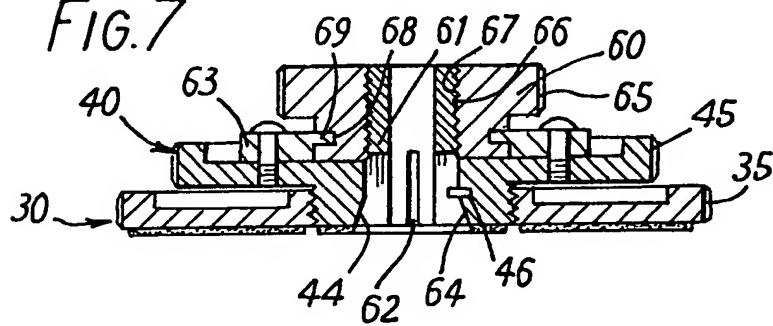
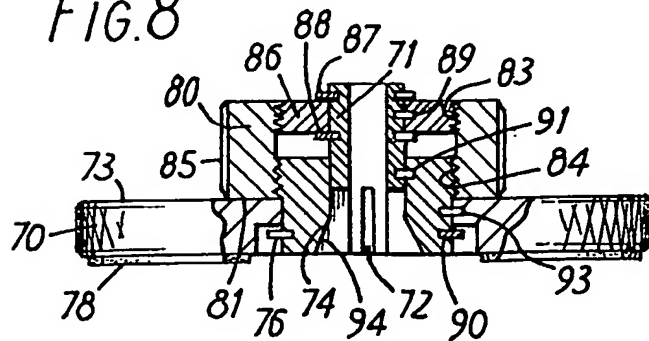


FIG. 8



SPECIFICATION

Clamp mechanisms

5 This invention relates to clamp mechanisms and in particular to a clamp mechanism (hereinafter referred to as "for the said purpose") for clamping an article to a support therefor, the support being fast with a spindle to extend through the article. One preferred form of clamp mechanism for the said purpose will be hereinafter referred to as a "record clamp mechanism" and for such a mechanism the article concerned is a phonographic record disc and the support is a turntable platter.

15 According to one aspect of this invention there is provided a clamp mechanism for the said purpose and comprising a first member to engage said spindle, a second member co-operable with said first member to render said first member fast with said spindle, and a third member co-operable with one of the aforesaid members such as, in use, to be movable longitudinally of the spindle axis relative to said one member for effecting clamping or release of the article between said third member and said support.

Advantageously the first member comprises a hollow cylindrical split-collet having a tapering free end that is co-operable with a correspondingly tapered seat in the second member such that relative longitudinal movement in one direction along the collet axis will effect a radial contraction of the collet's free end for rendering said first member fast with a said spindle inserted into the collet. Conveniently the first and second member are provided with co-operating screw-threads such that relative rotation thereof results in said relative longitudinal movement and, in said one direction, consequential radial contraction.

Advantageously said third member and said one member are provided with co-operating screw-threads such that relative rotation thereof results in said third member's relative movement longitudinally of the spindle and consequential clamping or release of the article between said third member and said support.

Preferably the second member constitutes said one member with which the third member is co-operable.

By way of non-limiting example, record clamp mechanisms embodying this invention will now be described with reference to the accompanying drawing of which:

Figure 1 is an exploded side elevation of a first record clamp mechanism incorporating members 10, 20 and 30,

Figure 2 is a plan view of member 10,

Figure 3 is a plan view of member 20,

Figure 4 is a plan view of member 30,

Figure 5 is an axial cross-section through a second record clamp mechanism embodying this invention, *Figure 6* is a schematic perspective view of part of the embodiment *Figure 5*,

Figure 7 is an axial cross-sectional view of a third record clamp mechanism embodying this invention, and

Figure 8 is an axial cross-section through a fourth record clamp mechanism embodying this invention.

Member 10 comprises a hollow cylindrical metal collet 11 that is longitudinally split at 12 across two mutually perpendicular diameters (see *Figure 2*). The collet 11 is surmounted by an integral disc-like knob or head 13 and has its free bottom end formed with a downwardly and inwardly directed external taper 14. The peripheral surface 15 of knob 13 is knurled.

Between the knob or head 13 and bottom taper 14, the collet 11 has an external screw-threaded portion 16.

The intermediate member 20 comprises an annular metal disc 22 integral with a depending bush 23.

A generally cylindrical bore 21 extends centrally through the member 20, the bore 21 being provided at its lower end with a downwardly and inwardly directed internal taper 24 corresponding to external taper 14 of member 10. Above the taper 24, the bore 21 is provided with an internal screw-threaded portion 26 for matingly threaded co-operation with the externally screw-threaded portion 16 of member 10. The outer cylindrical surface of bush 23 is provided with an externally screw threaded portion 27 and its lowermost radial surface has a disc-shaped protective covering 28 of felt or baize adhesively bonded thereto. The disc 22 has an upstanding peripheral wall 29 of which the external surface 25 is knurled.

The third member 30 comprises an annular metal disc 32. The central bore 31 of disc 32 is provided with an internally screw threaded portion 37 for matingly threaded co-operation with the external screw-threaded portion 27 of member 20. An annular recess 33 is provided in the upper surface of disc 32 thereby to provide inner and outer upstanding walls 34 and 36, the outer wall 36 having its outermost cylindrical surface 35 knurled. An annular-shaped protective covering 38 of felt or baize is adhesively bonded to the lower surface of member 30.

The members 10, 20 and 30 are assembled by loosely screwing male-threaded collet portion 16 into the matingly female threaded portion 26 of member 20, and by fairly tightly screwing up the male-threaded portion 27 of bush 23 into the matingly female-threaded portion 37 of member 30 until the protective disc 28 projects outwardly slightly beyond the protective annular surface 38. This is facilitated by ensuring that the axial thickness of bush 23 exceeds the axial thickness of disc 32.

In use, a phonographic record disc is placed on a turntable platter with the platter's spindle extending through the central hole of the record disc (in the conventional manner). The assembly of members 10, 20 and 30 is then placed above the record disc with the upwardly projecting portion of the spindle extending into collet 11. Member 20 is manually held against rotation, its knurled perimeter 25 abiding this, whilst knob 13 is rotated to screw in collet 11 into member 20. Due to the seating of taper 14 against taper 24, this continued rotation causes radial contraction of collet 11 about the spindle (facilitated by the slots 12) until the collet 11 grips the spindle very tightly and ultimately retains members

10 and 20 frictionally fast with the spindle. Whilst continuing manually to hold the member 20 against rotation, the member 30 is then rotated and, in effect, screwed off the bush 23 so as to compress the record against its supporting platter and clamp it in position. The clamping forces are in effect transmitted between the turntable platter and the spindle so that damage to the turntable mounting means and bearings is minimised if not totally avoided. These clamping pressures not only ensure that there is no slipping of the record disc relative to the rotating platter during playing of the record disc, but also tend to flatten the record disc and decrease the degree of any warping to which the record disc has been subjected. The pads 28, 38 of felt or baize serve to protect the record discs against damage by scratching.

To declamp the record disc from off the platter, the reverse procedure is adopted or, as is often more convenient, knob 13 is merely unscrewed (whilst manually holding member 20 against rotation) to release the assembly as a whole from off the spindle.

In the embodiment of Figures 5 and 6, the clamping member 30 is identical to the member 30 of Figure 1. However, instead of cooperating with member 20, it now cooperates with a member 40. Like member 20, member 40 comprises an annular metal disc 42 integral with a depending bush 43. The outer cylindrical surface of bush 43 is provided with a screw-threaded portion 47 that is matingly cooperable with the female-threaded portion 37 of member 30. The lowermost radial surface of bush 43 is covered by an annular pad 48 of felt or baize similar to protective covering 28 of member 20. In contrast to member 20, member 40 has its bore 41 non-threaded and at its lowermost end is provided with a downwardly and outwardly directed internal taper 44. A hollow cylindrical metal collet 51 that is longitudinally split at 52 across two mutually perpendicular diameters, has its free bottom end formed with a downwardly and outwardly directed external taper 54 for cooperation with taper 44. A pivot pin 55 extends through the collet 51 adjacent its upper end. Two like cam members 53 of generally pear-shape are mounted eccentrically on the ends of pivot pin 55 and are interconnected by an uppermost operating rod 50. The camming surface 56 of each cam member 53 cooperates with the upper surface 49 of member 40.

Operation of the assembled record clamp mechanism of Figures 5 and 6 is similar to that of the mechanism of Figures 1 - 3 except that initial securing of the mechanism to the spindle is by depressing operating rod 50 so that the cam members 53 cause collet 51 to rise upwardly with respect to member 40 such that the taper 44 acts upon mating taper 54 to contract the split metal collet 51 radially inwardly into frictionally tight clamping engagement of the spindle. Relative movement of member 30 is thereafter as described for the embodiment of Figures 1 - 3.

The assembly of Figures 5 and 6 is declamped either by reversing the clamping procedure or by merely raising operating rod 50 to release collet 51 and enable removal of the assembly as a whole.

In the embodiment of Figure 7, members 30 and 40 are substantially as described above. A hollow cylindrical metal collet 61 is longitudinally split at 62 across two mutually perpendicular diameters. The member 40 is provided with a radially directed key 46 that projects inwardly into one of the slots 62. The lower end of collet 61 is provided with a downwardly and outwardly directed taper 64 to cooperate with taper 44 of member 40, and the upper end of collet 61 is provided with an externally threaded portion 66. A cylindrical member 60 is provided with an internal threaded portion 67 to mate with portion 66, and is also provided externally with a circumferential groove 68. A holding ring 63 formed of two separate semi-circular portions is annularly rebated to provide a radially directed flange 69 that engages in circumferential groove 68. The holding ring 63 is secured by angularly spaced apart screws to the member 40. The member 60 has an enlarged radius head, the periphery 64 of which is knurled.

In operation, screwing member 60 in one direction relative to manually held member 40, causes collet 61 to cooperate by its taper 64 with the taper 44 of member 40 thereby to effect radial contraction of the collet and tight gripping of the spindle. The key 46 projecting into slot 62 ensures that the collet 61 is held irrotational with member 40. The record disc can then be clamped to the turntable platter by rotation of member 30 as before. The assembly is declamped by reversing the clamping procedure or, more simply, merely by rotating member 60 in the reverse direction. The holding ring 63 and key 46 ensure that during such counter-rotation of member 60 the latter cannot move longitudinally away from member 40 whilst the collet 61 rotates, but that the collet 61 must move longitudinally with respect to, and unseat itself from off, the member 40.

With the above-described embodiments of this invention, two separate actions are necessary to effect clamping. Thus with the embodiment of Figures 1 - 3, the two actions are rotation of member 10 followed by rotation of member 30; with the embodiment of Figures 5, 6 the two actions are operating rod 50 followed by rotation of member 30; with the embodiment of Figure 7 the two actions are rotation of member 60 followed by rotation of member 30. However, with the embodiment of Figure 8 described below, only one action is required, namely the rotation of a single member 80.

As illustrated in Figure 8, member 80 is a hollow cylindrical ring internally provided with an upper left-hand female thread 83 and a lower right-hand female thread 84. An externally threaded collar 86 is in matingly threaded engagement with upper thread 83 and is positionally fixed with respect to a hollow cylindrical metal collet 71 that is longitudinally split at 72 across two mutually perpendicular diameters. Such positional fixing of collet 81 and collar 86 is by means of upper and lower circlips 87, 88 and a key 89 directed radially inwardly from collar 86 into a slot 72. An externally threaded hollow cylindrical metal bush 90 is in matingly threaded engagement with lower thread 84 and is internally provided with a downwardly and outwardly directed taper 94 that is cooperable with a downwardly and outwardly

directed taper 74 provided at the lower end of collet 71. The bush 90 is internally keyed to the collet 71 by means of a key 91 projecting radially inwardly into a slot 72, and is also externally keyed to a metal annular member 70 by means of a key 93. The annular member 70 encompasses bush 90 below member 80. The upper radial surface 73 of member 70 is contactable by the lower radial surface 81 of member 80. The lower radial surface of member 70 is centrally rebated to accommodate a circlip 76 engaging member 90 and preventing member 70 from sliding off member 90. The location of circlip 76 is such as to allow member 70 to move freely in the axial direction between limits defined by the circlip 76 and the surface 81 of member 80. An annular pad 78 of felt or baize is adhesively bonded to the lower radial surface of member 80 to provide a protective covering.

In use of the embodiment of Figure 8, initial rotation of member 80 in one direction causes axial separation of collar 86 and bush 90, this result being due to the different "handing" of threaded portions 83 and 84. Such axial separation effects co-operation between the bush's taper 94 and taper 74 of collet 71 whereby the latter is contracted radially inwardly to grip the spindle. This grip is intensified as rotation of member 80 is continued such that surface 81 contacts surface 73 and urges member 70 downwardly to clamp the record disc against the turntable platter. This action is facilitated if the left-handed threaded portion 83 is of slightly finer thread than that of the right-handed threaded portion 84.

It will be seen that in Figures 1 - 3, member 10 is to engage the spindle, member 20 is cooperable directly with member 10 to render member 10 fast with the spindle, and member 30 is cooperable directly with member 20 such as to be movable longitudinally of the spindle axis and effect clamping of the record disc between member 30 and the turntable platter. In Figures 5 and 6, collet 51 is to engage the spindle, member 40 is cooperable (directly via corresponding tapers 44, 54 and indirectly via eccentric mechanism 50, 53 and 55) with collet 51 to render collet 51 fast with the spindle, and member 30 is cooperable directly with member 40 such as to be movable longitudinally of the spindle axis and effect clamping of the record disc between member 30 and the turntable platter. In Figure 7, collet 61 is to engage the spindle, member 40 with retainer ring 63 attached thereto is cooperable (directly via corresponding tapers 44, 64 and indirectly via member 60) with collet 61 to render collet 61 fast with the spindle, and member 30 is cooperable directly with member 40 such as to be movable longitudinally of the spindle axis and effect clamping of the record disc between member 30 and the turntable platter. In Figure 8, collet 71 is to engage the spindle, bush 90 is cooperable (directly via corresponding tapers 74, 94 and indirectly via member 80 and collar 86) with the collet 71 to render collet 71 fast with the spindle, and member 70 is cooperable indirectly via member 80 and key 93 with bush 90 such as to be movable longitudinally of the spindle axis and effect clamping of the record disc between member 30 and the turntable platter. An alternative way of considering

the embodiment of Figure 8 is to regard collet 71 as to engage the spindle, member 80 as cooperable indirectly with collet 71 via bush 90 and corresponding tapers 74, 94 so as to render collet 71 fast with the spindle, and member 70 as cooperable directly via surfaces 81, 73 with the member 80 such as to be movable longitudinally of the spindle axis and effect clamping of the record disc between member 30 and the turntable platter.

It will be appreciated that each of the above described and illustrated embodiments of this invention provides a record clamp mechanism that can be utilised without unduly compressing the resilient mountings for the turntable platter, and wherein the clamping forces are taken up and act between the turntable platter and the spindle whereby damage to the turntable mounting means and bearings is substantially obviated. Furthermore, the clamping forces are not localised to specific small angularly spaced zones on the record disc surface but are applied substantially continuously over an annular surface defined by the pads 38, 78.

CLAIMS

1. A clamp mechanism for the said purpose and comprising a first member to engage said spindle, a second member cooperable with said first member to render said first member fast with said spindle, and a third member cooperable with one of the aforesaid members such as, in use, to be movable longitudinally of the spindle axis relative to said one member for effecting clamping or release of the article between said third member and said support.
2. A clamp mechanism according to Claim 1 wherein the first member comprises a hollow cylindrical split collet having a tapering free end that is cooperable with a correspondingly tapered seat in the second member such that relative longitudinal movement in one direction along the collet axis will effect a radial contraction of the collet's free end for rendering said first member fast with a said spindle inserted into the collet.
3. A clamp mechanism according to Claim 2 wherein the first and second member are provided with cooperating screw threads such that relative rotation thereof results in said relative longitudinal movement and, in said one direction, consequential radial contraction.
4. A clamp mechanism according to Claim 2 wherein the first and second members are cooperable with one another indirectly via an intermediate device cooperable with said first and second members.
5. A clamp mechanism according to any preceding claim wherein said third member and said one member are provided with cooperating screw threads such that relative rotation thereof results in said third member's relative movement longitudinally of the spindle and consequential clamping or release of the article between said third member and said support.
6. A clamp mechanism according to any preceding claim wherein the second member constitutes said one member with which the third member is

cooperable.

7. A record clamp mechanism according to any preceding claim.

8. A record clamp mechanism substantially as herein described with reference to and/or as illustrated in Figures 1 - 3, Figures 5 and 6, Figure 7 or Figure 8 of the accompanying drawings.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1982.
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